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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/585,326	07/06/2006	Harue Nakashima	0756-7732	9757

31780 7590 06/30/2009

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EXAMINER	
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ART UNIT	PAPER NUMBER
4132	

MAIL DATE	DELIVERY MODE
06/30/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/585,326	NAKASHIMA ET AL.	
	Examiner	Art Unit	
	Andrew K. Bohaty	4132	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2006/07/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The amendment was filed on 2006 July 06 was improper. The applicant did not appropriately underline all added text. In claims 5-7 the term "claim" was added in each claim and was not underlined. All other added text was correctly underlined in the rest of the claims.

2. Claims 5-7 were examined as if the amendment was proper and the term "claim" was correctly underlined.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-48 are rejected under 35 U.S.C. 102(e) as being anticipated by Hwang et al. (US 2006/0020136) (hereafter "Hwang").

5. Regarding claims 1-9, Hwang discloses carbazole derivatives (formulae (1) and (2), paragraphs [0011]-[0015] and [0046] and compounds 1-9, 12, 14, 15 and 17-24 on pages 4-8) that teach the limitations of the carbazole compounds present in claims 1-9.

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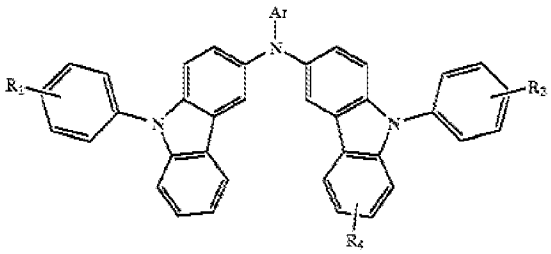

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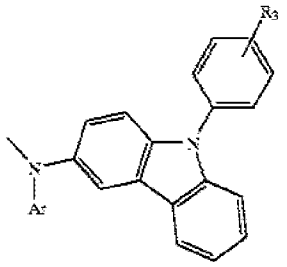

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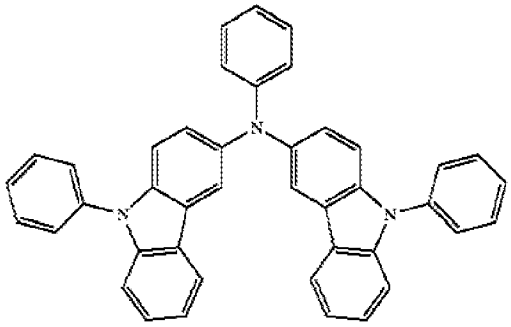

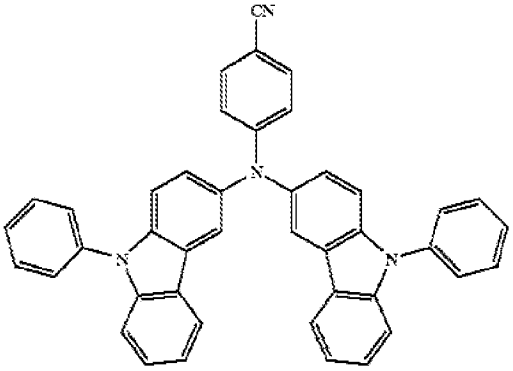

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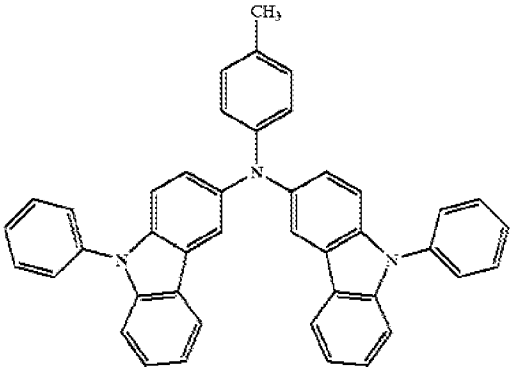

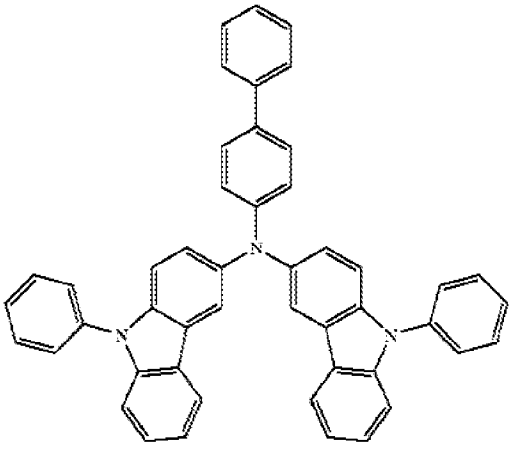

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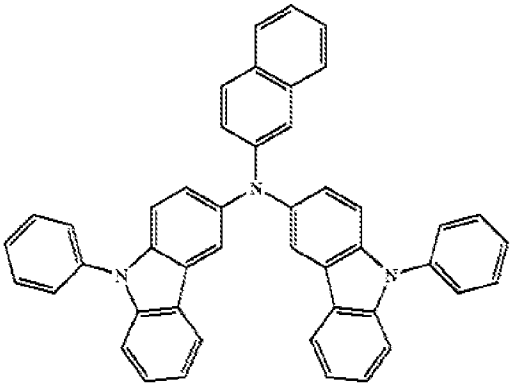

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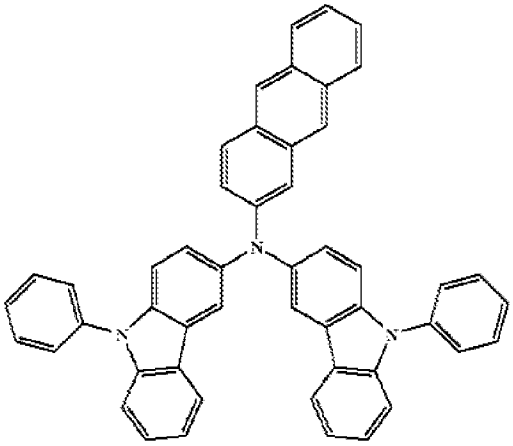

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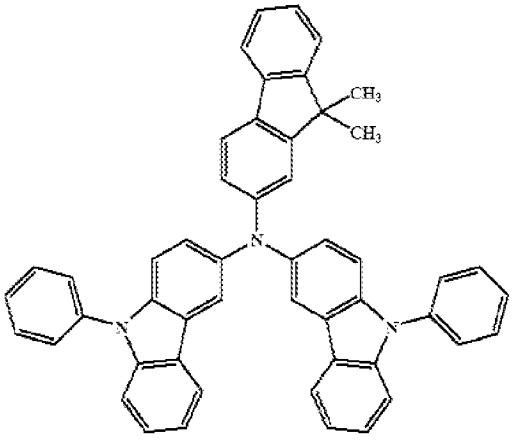

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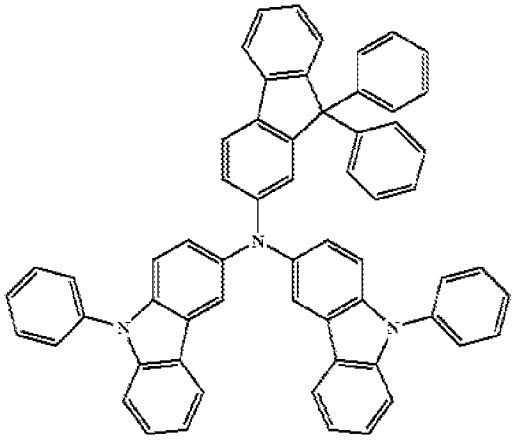

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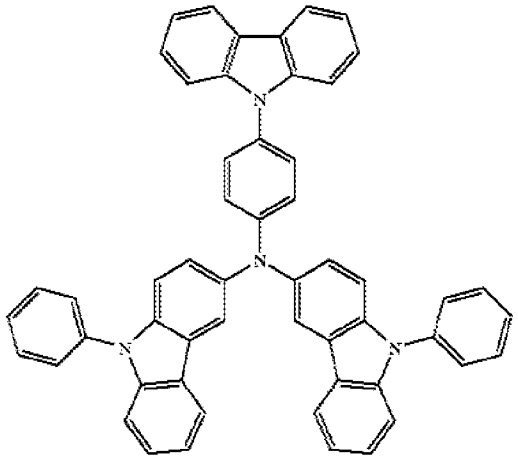

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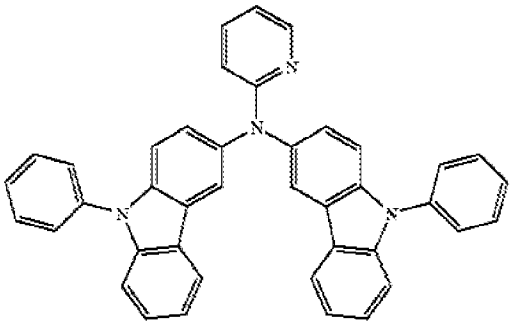

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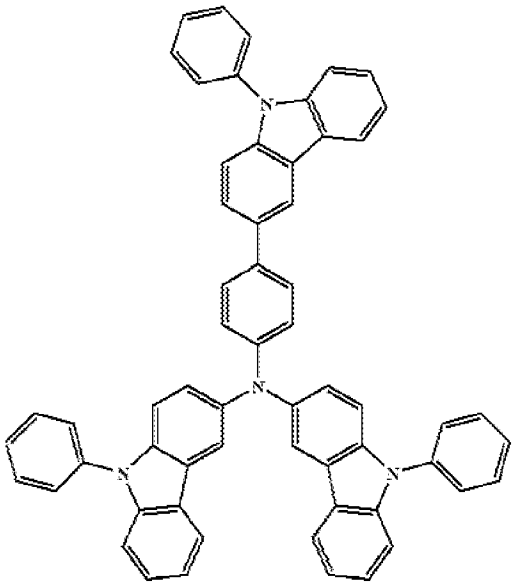

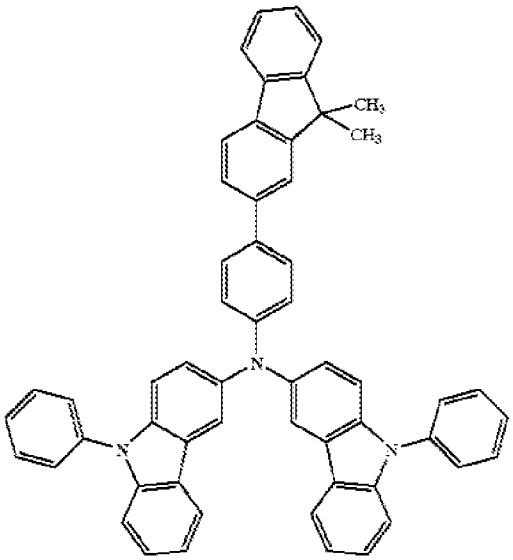

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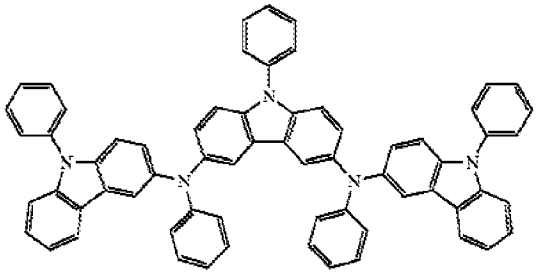

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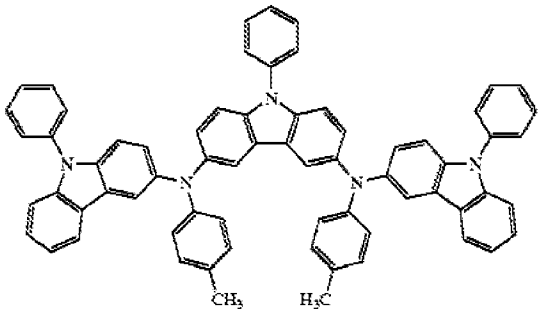

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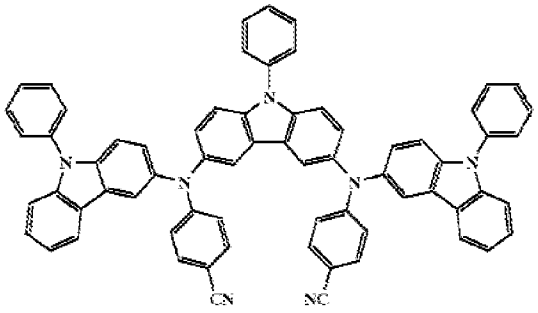

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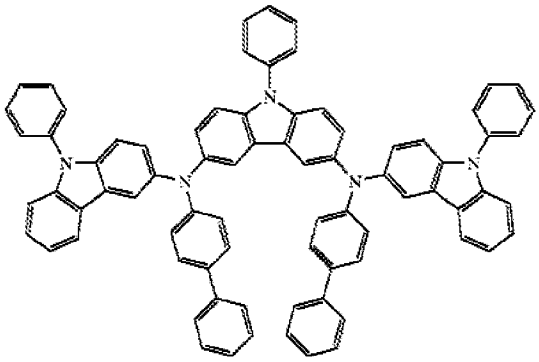

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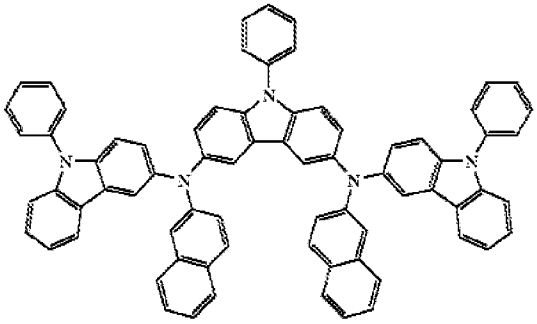

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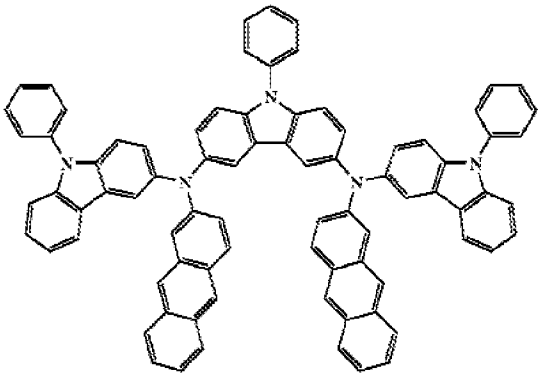

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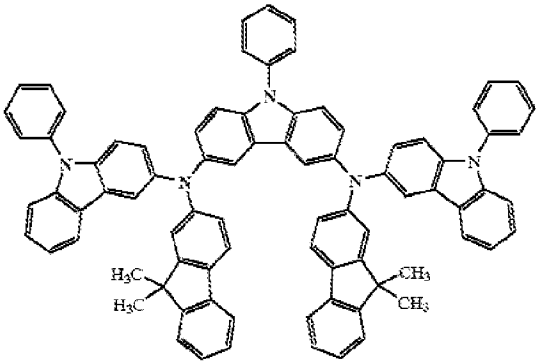

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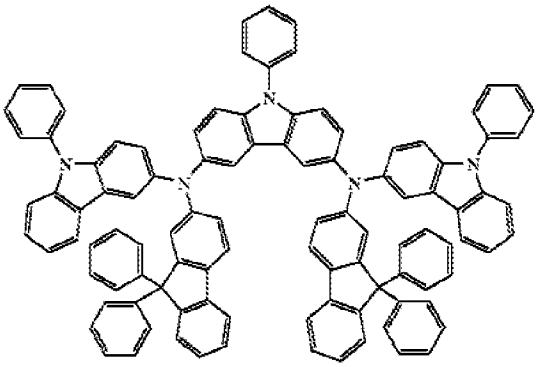
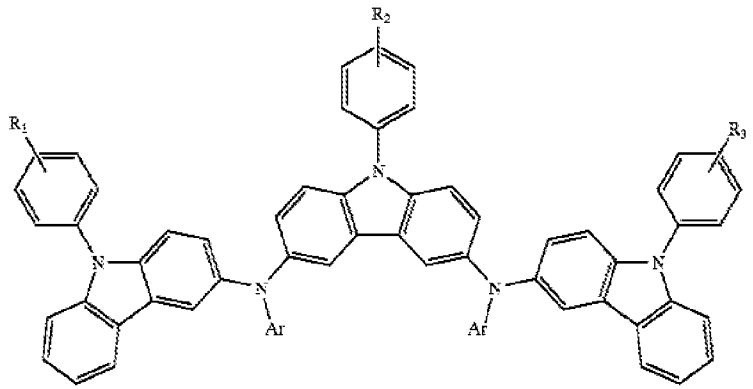


6. Regarding claims 10, 11, and 13-17, Hwang discloses carbazole derivatives (formula (1) paragraphs [0011]-[0013] and [0042] and compounds 1-9, 12, 14, and 15 on pages 4-7, shown above) that teach the limitations of the carbazole compounds present in claims 10, 11, and 13-17.

7. Regarding claims 12 and 25-28, Hwang discloses carbazole derivatives (formula (4), paragraphs [0017], [0018], and [0042] and compounds 17 and 21 on page 7, shown above) that teach the limitations of the carbazole compounds present in claims 12 and 25-28.

(4)



8. Regarding claim 18, Hwang discloses carbazole derivatives (formula (1), paragraphs [0012]-[0014] and [0042], where R_1, R_2, and R_4 are hydrogen and Ar is phenyl or napthyl, and compounds 1 and 5 on pages 4 and 5, shown above) that teach the limitations of the compounds present in the claim.

9. Regarding claim 19, Hwang discloses carbazole derivatives (formula (4), paragraphs [0017], [0018], and [0042], where R_1-R_3 are hydrogen and Ar is phenyl or

napthyl, and compounds 17 and 21 on page 7, shown above) that teach the limitations of the compounds present in the claim.

10. Regarding claims 20, 21, 23, 29, 30, 32, 34, 35, 37, 39, 40, 42, 44, 45, and 47, Hwang teaches a light emitting element (Fig. 1, objects cathode, anode, and EML, paragraph [0049]) comprising of an anode (Fig. 1, anode), a cathode (Fig. 1, cathode), and a light-emitting layer between the anode and the cathode (Fig. 1, EML, paragraph [0052]), wherein the light-emitting layer comprises any of carbazoles mentioned in claims 1-19 and 25-28 and can contain additional luminescent substances (paragraphs [0024], [0025], [0027], [0037], and [0052]).

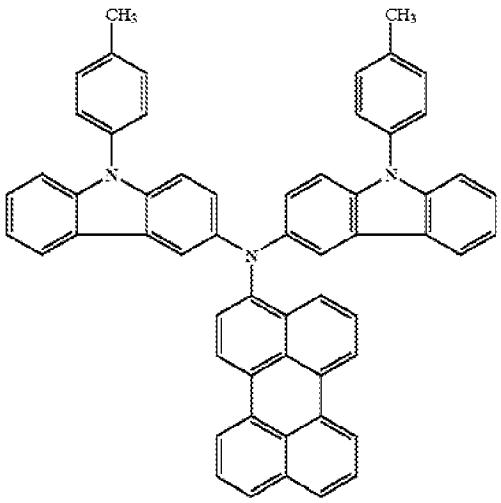
11. Regarding claims 22, 31, 36, 41, and 46, Hwang teaches that any of the carbazoles taught can also be used in the hole injecting layer, which is between the light-emitting layer and the anode and is in contact with the anode (Fig. 1, EIL, paragraph [0024]-[0026]).

12. Regarding claims 24, 33, 38, 43, and 48, Hwang teaches that a light-emitting device can be manufactured using the claimed light emitting element (paragraph [0076]).

13. Claims 1-3, 5, 6, 10, 11, 20, 21, 23, 24, 29, 30, 32, and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Onikubo et al. (US 2004/0151944) (hereafter “Onikubo”).

14. Regarding claims 1-3, 5, 6, 10, and 11, Onikubo discloses a carbazole derivative (compound A24 page 11) that teaches the limitations of the carbazole compounds present in the claims 1-3, 5, 6, 10, and 11.

A24

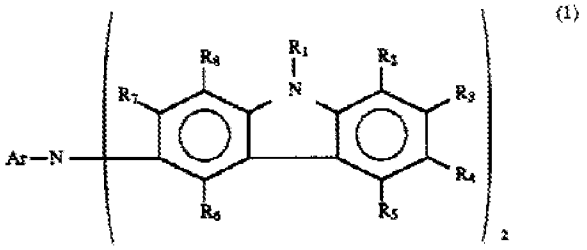


15. Regarding claims 20, 21, 23, 29, 30, and 32, Onikubo teaches a light emitting element (Fig. 1A and 1B, objects 11, 12, 20, and 21, paragraphs [0068] and [0069]) comprising of an anode (Fig. 1A and 1B, object 11), a cathode (Fig. 1A and 1B, object 12), and a light-emitting layer between the anode and the cathode (Fig. 1A, 20, Fig. 1B, 21, paragraphs [0068] and [0069]), wherein the light-emitting layer comprises a carbazole derivative (compound A24 is an A compound, paragraph [0048] and [0049]) and can contained additional luminescent substances. Hwang teaches that a mixture of compound A, where A24 is a carbazole, and compound B are used as a light emitting layer (paragraph [0048] and [0049]) and this layer can be in contact with the anode (Fig. 1A, 11 and 20, paragraph [0068]).

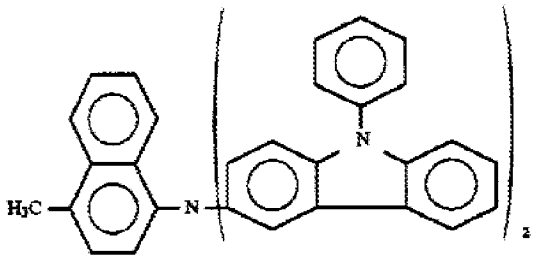
16. Regarding claims 24 and 33, Hwang teaches that these light-emitting elements can be a used in light emitting devices (paragraph [0001]).

17. Claims 1-6, 10, 11, and 14-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanaka et al. (US 576248) (hereafter "Tanaka").

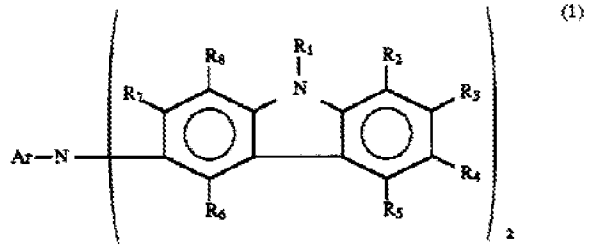
18. Regarding claims 1-6, Tanaka discloses a carbazole formula (formula (1) column 3 lines 11-32) that represents general formula (1), wherein R^{11} and R^{13} (R_1) are the same and represents an alkyl group having 1 to 4 carbon atoms (column 3 lines 15-18), an aryl group (phenyl, naphthyl, or biphenyl, column 3 lines 19-21), or an arylalkyl group (benzyl or phenethyl column 3 lines18-19). Ar^{11} (Ar) is preferably a phenyl, naphthyl, pyridyl, indolyl or benxothienyl group (column 3 lines 29-32). R^{12} and R^{14} (R_4) are hydrogen or an alkyl group having 1 to 4 carbon atoms (column 3 lines 12-18).



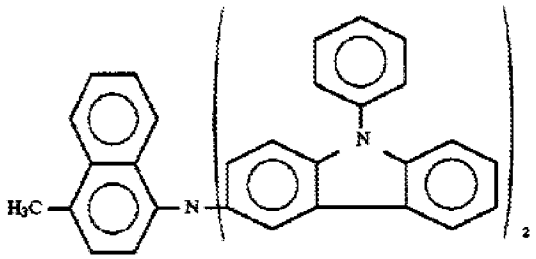
19. Tanaka also discloses carbazole compounds (columns 3-11, compounds 1-33) that teach the limitations of the compounds present in the claims 1-6. Below is a compound (compound 31, column 11) disclosed by Tanaka that specifically discloses the limitations in claims 1-6.



20. Regarding claims 10, 11, and 14-17, Tanaka discloses a carbazole formula (formula (1) column 3 lines 11-32) that represents general formula (3) where R^{23} is general formula (4), wherein R^{21} and R^{24} (R_1) represents an alkyl group having 1 to 4 carbon atoms (column 3 lines 15-18), an aryl group (phenyl, naphthyl, or biphenyl, column 3 lines 19-21), or an arylalkyl group (benzyl or phenethyl column 3 lines18-19). Ar^{21} (Ar) is preferably a phenyl, naphthyl, pyridyl, indolyl or benxothienyl group (column 3 lines 29-32). R^{22} and R^{25} (R_4) are hydrogen or an alkyl group having 1 to 4 carbon atoms (column 3 lines 12-18).

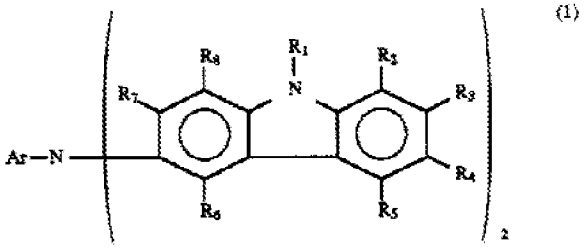


21. Tanaka also discloses carbazole compounds (columns 3-11, compounds 1-33) that teach the limitations of the compounds present in the claims 1-6. Below is a compound (compound 31, column 11) disclosed by Tanaka that specifically discloses the limitations in claims 10, 11, and 14-17.



22. Regarding claim 18, Tanaka discloses a carbazole formula (formula (1) column 3 lines 11-32), where R_2-R_8 can be hydrogen (column 3 lines 12-13), R_1 is preferably

phenyl (column 3 lines19-22), and Ar is preferably phenyl or naphthyl (column 3 lines 29-30).

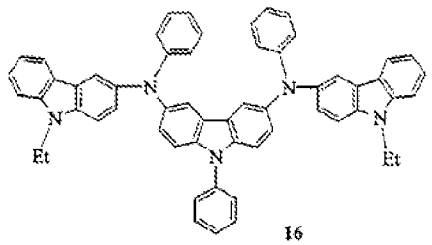


(1)

23. Given the teachings of Tanaka, one of ordinary skill in the art would immediately envisage the compound represented by general formula (7), wherein Ar^{31} represents phenyl or naphthyl.

24. Claims 1, 2, 4, 5, 7, 9, 12, 13, 20, 21, 23, 24, 27, 28, 34, 35, 37, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Thomas et al. (Journal of the American Chemical Society, year 2001, volume 123, pages 9404-9411) (hereafter "Thomas").

25. Regarding claims 1, 2, 4, 5, 7, 9, 12, 13, 27, and 28, Thomas discloses a carbazole derivative (page 9406, compound 16), that teaches the limitations of the carbazole compounds present in the claims 1, 2, 4, 5, 7, 9, 12, 13, 27, and 28.



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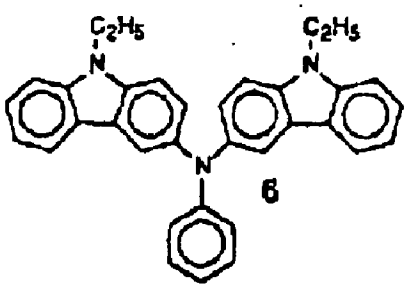
26. Regarding claims 20, 21, 23, 24, 34, 35, 37, and 38, Thomas discloses a light-emitting element comprising an anode (ITO), a cathode (an alloy of magnesium and silver) and a light-emitting layer (carbazole derivatives) between the anode and the cathode (page 9404, right column, entire top paragraph of the column before the heading experimental section, page 9406 left column, the entire paragraph), wherein the light-emitting layer comprises a carbazole derivative, which is the luminescent substance. Thomas teaches that the layer containing any of their carbazole derivatives, which compound 16 is preferred compound, is both a light-emitting layer and a hole-transporting layer. This means the carbazole derivative is the luminescent substance in the layer (page 9404, right column, entire top paragraph of the column before the heading experimental section). Thomas teaches that the carbazole derivative layer (light-emitting layer and hole-transporting layer) are in contact with the anode (page 9406 left column, the entire paragraph).

27. Regarding claims 24 and 33, Thomas teaches that light-emitting elements (electroluminescent devices) can be a used in light emitting devices (flat-panel displays and LEDs) (page 9404 left column first paragraph).

28. Claims 1, 3, 5, 6, 10, 11, 16, and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Ballonyte et al. (Environmental and Chemical Physics, year 2002, volume 24, pages 30-34) (hereafter “Ballonyte”).

29. Regarding claims 1, 3, 5, 6, 10, 11, 16, and 17, Ballonyte et al. discloses a carbazole derivative (compound 6 page 31) that teaches the limitations of the carbazole compounds present in the claims 1-3, 5, 6, 10, 11, 16, and 17.



6

Claim Rejections - 35 USC § 103

30. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

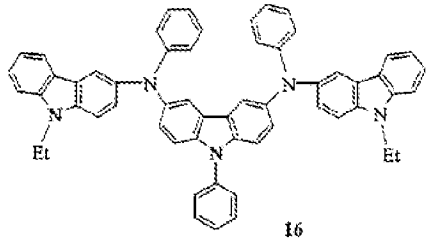
31. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

32. Claims 3, 8, 19, 25, 26, 44, 45, 47, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas et al. (Journal of the American Chemical Society,

year 2001, volume 123, pages 9404-9411) (hereafter "Thomas") as applied to claims 1, 2, 4, 5, 7, 9, 12, 13, 20, 21, 23, 24, 27, 28, 34, 35, 37, and 38.

33. Regarding claim 3, Thomas discloses a carbazole derivative represented by applicant's formula (1), wherein R^{14} is formula (2), R^{12} and R^{16} are hydrogen, R^{13} is phenyl, Ar^{11} and Ar^{12} are phenyl (page 9406, compound 16).



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34. Thomas does not teach a carbazole derivative represented by applicant's formula (1), wherein R^{11} and R^{13} are the same.

35. Thomas does teach that N-substituent of the carbazole skeleton can be either ethyl, phenyl, or fused aromatics (page 9407, left column last paragraph). Thomas teaches that changing the substituent can change the hole-transporting and emitting properties of the carbazole derivative (page 9407, left column last paragraph).

36. It would have been obvious by one of ordinary skill in the art at the time the invention was made to substitute the ethyl groups substituted at R^{11} and R^{15} (as referenced by applicant in general formula (1) and general formula (2)) in the carbazole derivative of Thomas with phenyl groups as taught by Thomas at arrive at a carbazole derivative wherein R^{11} and R^{13} are the same, since R^{13} is already phenyl. Thomas teaches that N-substituent of the carbazole skeleton can be ethyl, phenyl, or fused aromatics to tune the hole-transporting and light-emitting properties of the carbazole

derivative. One of ordinary skill in the art would have been motivated to substitute the ethyl groups of the carbazole derivative, of Thomas, with phenyl groups because phenyl groups are known to be substituents at the N position of carbazole derivatives, and because it would be a simple substitution of substitutents for one of ordinary skill in the art that would lead to predictable results of a carbazole derivative as a material in an EL device.

37. Regarding claim 8, Thomas discloses a carbazole derivative represented by applicant's formula (1), wherein R^{14} is formula (2), R^{12} and R^{16} are hydrogen, R^{13} is phenyl, Ar^{11} and Ar^{12} are phenyl (page 9406, compound 16, see above).

38. Thomas does not teach a carbazole derivative represented by applicant's formula (1), wherein R^{15} represents an aryl group having 6 to 25 carbon atoms, or a hetero aryl group having 5 to 9 carbon atoms.

39. Thomas does teach that N-substituent of the carbazole skeleton can be ethyl, phenyl, or fused aromatics (page 9407, left column last paragraph). Thomas teaches that changing the substituent can change the hole-transporting and emitting properties of the carbazole derivative (page 9407, left column last paragraph).

40. It would have been obvious by one of ordinary skill in the art at the time the invention was made to substitute the ethyl group substituted at R^{15} (as referenced by applicant in general formula (1) and general formula (2)) in the carbazole derivative of Thomas with a phenyl group as taught by Thomas at arrive at a carbazole derivative wherein R^{15} represents an aryl group having 6 to 25 carbon atoms. Thomas teaches that N-substituent of the carbazole skeleton can be ethyl, phenyl, or fused aromatics to

tune the hole-transporting and light-emitting properties of the carbazole derivative. One of ordinary skill in the art would have been motivated to substitute the ethyl groups of the carbazole derivative, of Thomas, with phenyl groups because phenyl groups are known to be substituents at the N position of carbazole derivatives, and because it would be a simple substitution of substitutents for one of ordinary skill in the art that would lead to predictable results of a carbazole derivative as a material in an EL device.

41. Regarding claim 19, Thomas discloses a carbazole derivative wherein the N-substitutents on the two terminal carbazole groups are ethyl (page 9406, compound 16, see above). Thomas discloses that Ar^{41} and Ar^{42} (with respect to applicant's general formula (8)) are phenyl.

42. Thomas does not teach a carbozole derivative wherein all the N-substituents are phenyl groups.

43. Thomas does teach that N-substituent of the carbazole skeleton can be ethyl, phenyl, or fused aromatics (page 9407, left column last paragraph). Thomas teaches that changing the substituent can change the hole-transporting and emitting properties of the carbazole derivative (page 9407, left column last paragraph).

44. It would have been obvious by one of ordinary skill in the art at the time the invention was made to substitute the ethyl groups at the N-substitutent positions of the two terminal carbazole groups in the carbazole derivative of Thomas with phenyl groups as taught by Thomas at arrive at a carbazole derivative represent by general formula (8) wherein Ar^{41} and Ar^{42} are phenyl. Thomas teaches that N-substituent of the carbazole skeleton can be ethyl, phenyl, or fused aromatics to tune the hole-transporting and light-

emitting properties of the carbazole derivative. One of ordinary skill in the art would have been motivated to substitute the ethyl groups of the carbazole derivative, of Thomas, with phenyl groups because phenyl groups are known to be substituents at the N position of carbazole derivatives, and because it would be a simple substitution of substitutents for one of ordinary skill in the art that would lead to predictable results of a carbazole derivative as a material in an EL device.

45. Regarding claims 25 and 26, Thomas discloses a carbazole derivative represented by applicant's formulae (5), wherein R^{22} and R^{23} are formula (6), both R^{25}'s are hydrogen, R^{21} is phenyl, both Ar^{21}'s are phenyl (page 9406, compound 16).

46. Thomas does not teach a carbazole derivative represented by applicant's formulae (5), wherein R^{22} and R^{23} are formula (6), wherein both R^{24}'s represent an aryl group having 6 to 25 carbon atoms, or a hetero aryl group having 5 to 9 carbons atoms and even more specifically phenyl groups.

47. Thomas does teach that N-substituent of the carbazole skeleton can be ethyl, phenyl, or fused aromatics (page 9407, left column last paragraph). Thomas teaches that changing the substituent can change the hole-transporting and emitting properties of the carbazole derivative (page 9407, left column last paragraph).

48. It would have been obvious by one of ordinary skill in the art at the time the invention was made to substitute the ethyl groups at the N-substitutent positions of the two terminal carbazole groups in the carbazole derivative of Thomas with phenyl groups as taught by Thomas at arrive at a carbazole derivative represent by general formula (5) wherein R^{22} and R^{23} are formula (6), wherein both R^{24}'s represent a phenyl group (an

aryl group containing 6 carbon atoms). Thomas teaches that N-substituent of the carbazole skeleton can be ethyl, phenyl, or fused aromatics to tune the hole-transporting and light-emitting properties of the carbazole derivative. One of ordinary skill in the art would have been motivated to substitute the ethyl groups of the carbazole derivative, of Thomas, with phenyl groups because phenyl groups are known to be substituents at the N position of carbazole derivatives, and because it would be a simple substitution of substitutents for one of ordinary skill in the art that would lead to predictable results of a carbazole derivative as a material in an EL device.

49. Regarding claims 44, 45, 47, and 48 modified claim 19 is relied upon.

50. Regarding claims 44, 45, and 47, Thomas discloses a light-emitting element comprising an anode (ITO), a cathode (an alloy of magnesium and silver) and a light-emitting layer (carbazole derivatives) between the anode and the cathode (page 9404, right column, entire top paragraph of the column before the heading experimental section, page 9406 left column, the entire paragraph), wherein the light-emitting layer comprises a carbazole derivative, which is the luminescent substance. Thomas teaches that the layer containing any of their carbazole derivatives, which compound 16 is preferred compound, is both a light-emitting layer and a hole-transporting layer. This means the carbazole derivative is the luminescent substance in the layer (page 9404, right column, entire top paragraph of the column before the heading experimental section). Thomas teaches that the carbazole derivative layer (light-emitting layer and hole-transporting layer) are in contact with the anode (page 9406 left column, the entire paragraph).

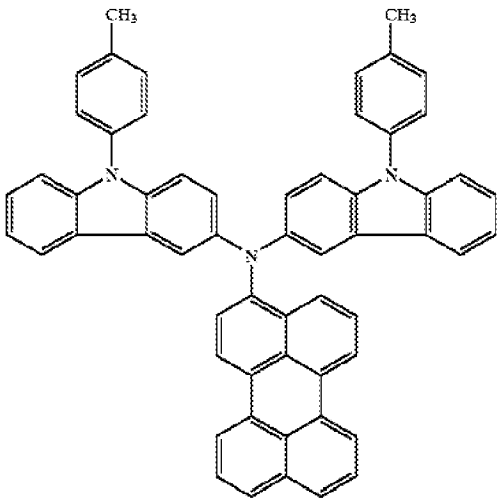
51. Regarding claims 48, Thomas teaches that light-emitting elements (electroluminescent devices) can be a used in light emitting devices (flat-panel displays and LEDs) (page 9404 left column first paragraph).

52. Claims 18, 39, 40, 42, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Onikubo et al. (US 2004/0151944) (hereafter "Onikubo") as applied to claims 1-3, 5, 6, 10, 11, 20, 21, 23, 24, 29, 30, 32, and 33 above, and further in view of Thomas et al. (Journal of the American Chemical Society, year 2001, volume 123, pages 9404-9411) (hereafter "Thomas").

53. Regarding claim 18, Onikubo discloses a carbazole compound (comound A24 page 11), wherein the N-subsitutents of the two carbazoles are alkyphenyl and Ar^{31} (with respect to applicant's general formula (7)) is pyrene.

54. Onikubo does not teach a carbazole compound wherein the groups attached at N-subsitutents of the two carbazoles are phenyl and Ar^{31} (with respect to applicant's general formula (7)) represents phenyl or naphtyl.

A24



55. Thomas teaches carbazole derivatives (compounds 9-16, and 18-20, page 9406) wherein the N-subsitutents of the carbazoles contain a phenyl group (compounds 10, 12, 15, 16, 19, and 20, page 9406) and the amino group connected to the carbazole contains phenyl (compounds 9-11, 13-16, 18-20, page 9406) or naphtyl (compounds 9, 10, and 18) to provide carbazole compounds that can be used as both a light-emitting material and a hole-transporting material (page 9404 right column paragraph above the heading experimental section).

56. It would have been obvious by one of ordinary skill in the art at the time the invention was made to substitute the alkylphenyl group at the N-substitutents of carbazoles and the pyrene group in the carbazole derivative of Onikubo with phenyl groups as taught by Thomas at arrive at a carbazole derivative represent by general formula (8) wherein R^{31} represents phenyl or naphtyl. Thomas teaches that phenyl groups can be at this positions in carbazole derivatives to make carbazoles that can be used as both a light-emitting material and a hole-transporting material. One of ordinary skill in the art would have been motivated to substitute the alkylphenyl groups and pyrene group of the carbazole derivative, of Onikubo, with phenyl groups because phenyl groups are known to be substituents at both positions of carbazole derivatives, and because it would be a simple substitution of substitutents for one of ordinary skill in the art that would lead to predictable results of a carbazole derivative as a material in an EL device.

57. Regarding claims 39, 40, 42, and 43, modified claim 18 is relied upon.

58. Regarding claims 39, 40, and 42, Onikubo teaches a light emitting element (Fig. 1A and 1B, objects 11, 12, 20, and 21, paragraphs [0068] and [0069]) comprising of an anode (Fig. 1A and 1B, object 11), a cathode (Fig. 1A and 1B, object 12), and a light-emitting layer between the anode and the cathode (Fig. 1A, 20, Fig. 1B, 21, paragraphs [0068] and [0069]), wherein the light-emitting layer comprises a carbazole derivative (compound A24 is an A compound, paragraph [0048] and [0049]) and can contained additional luminescent substances. Hwang teaches that a mixture of compound A, where A24 is a carbazole, and compound B are used as a light emitting layer (paragraph [0048] and [0049]) and this layer can be in contact with the anode (Fig. 1A, 11 and 20, paragraph [0068]).

59. Regarding claims 43, Hwang teaches that these light-emitting elements can be a used in light emitting devices (paragraph [0001]).

60. Claims 22, 31, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Onikubo et al. (US 2004/0151944) (hereafter “Onikubo”) as applied to claims 1-3, 5, 6, 10, 11, 20, 21, 23, 24, 29, 30, 32, and 33 above, of Thomas et al. (Journal of the American Chemical Society, year 2001, volume 123, pages 9404-9411) (hereafter “Thomas”) in view of and further in view of Lee et al. (US 2001/0046612) (hereafter “Lee").

61. Regarding claim 41, Onikubo in view of Thomas is relied upon as above.

62. Regarding claims 22, 31, and 41, Onikubo teaches a light emitting element (Fig. 1A and 1B, objects 11, 12, 20, and 21, paragraphs [0068] and [0069]) comprising of an

anode (Fig. 1A and 1B, object 11), a cathode (Fig. 1A and 1B, object 12), and a light-emitting layer between the anode and the cathode (Fig. 1A, 20, Fig. 1B, 21, paragraphs [0068] and [0069]), wherein the light-emitting layer comprises a carbazole derivative (compound A24 is an A compound, paragraph [0048] and [0049]) and can contained additional luminescent substances.

63. Onikubo and Onikubo in view of Thomas does not teach a light-emitting element, wherein the carbazole derivative is included between the anode and a layer having a light-emitting layer which is included in the layer including a luminescent substance.

64. Lee teaches that carbazole derivatives can be used as a hole-transporting material (paragraph [0032]) and used in a hole-transporting layer which is between the anode and the light emitting layer (paragraph [0073]) to provide an EL device with increased thermal stability (paragraph [0011]). Lee also teaches that multilayer systems that include a hole-transporting layer improve efficiency and luminance of an EL device (paragraph [0009]).

65. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the light-emitting element, of Onikubo and Onikubo in view of Thomas, to include a carbazole containing hole-transporting layer between the light-emitting layer and the anode as taught by Lee. Since Lee teaches carbazoles as a hole-transporting materials, the carbazole of Onikubo and Onibuko in view of Thomas, could be used in the hole-transporting layer. The motivation would have been to produce a light-emitting element with improved efficiency and luminance.

66. Claims 22, 36, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Onikubo et al. (US 2004/0151944) (hereafter “Onikubo”) as applied to claims 1-3, 5, 6, 10, 11, 20, 21, 23, 24, 29, 30, 32, and 33 above, in view of Thomas et al. (Journal of the American Chemical Society, year 2001, volume 123, pages 9404-9411) (hereafter “Thomas”) and further in view of Lee et al. (US 2001/0046612) (hereafter “Lee").

67. Regarding claim 46, modified Thomas pertaining to claim 19 above is relied upon.

68. Regarding claims 21, 36, and 46, Thomas and modified Thomas discloses a light-emitting element comprising an anode (ITO), a cathode (an alloy of magnesium and silver) and a light-emitting layer (carbazole derivatives) between the anode and the cathode (page 9404, right column, entire top paragraph of the column before the heading experimental section, page 9406 left column, the entire paragraph), wherein the light-emitting layer comprises a carbazole derivative, which is the luminescent substance. Thomas teaches that the layer containing any of their carbazole derivatives, which compound 16 is preferred compound, is both a light-emitting layer and a hole-transporting layer. This means the carbazole derivative is the luminescent substance in the layer (page 9404, right column, entire top paragraph of the column before the heading experimental section).

69. Thomas and modified Thomas do not teach a light-emitting element, wherein the carbazole derivative is included between the anode and a layer having a light-emitting layer which is included in the layer including a luminescent substance.

70. Lee teaches that carbazole derivatives can be used as a hole-transporting material (paragraph [0032]) and used in a hole-transporting layer which is between the anode and the light emitting layer (paragraph [0073]) to provide an EL device with increased thermal stability (paragraph [0011]). Lee also teaches that multilayer systems that include a hole-transporting layer improve efficiency and luminance of an EL device (paragraph [0009]).

71. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the light-emitting element, of Thomas and modified Thomas, to include a carbazole containing hole-transporting layer between the light-emitting layer and the anode as taught by Lee. Since Lee teaches carbazoles as a hole-transporting materials, the carbazole of Thomas and modified Thomas, could be used in the hole-transporting layer. Thomas teaches the use of carbazoles are hole-transporting materials (pare 9404 right column, first paragraph above the heading experimental section). The motivation would have been to produce a light-emitting element with improved efficiency and luminance.

Conclusion

72. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew K. Bohaty whose telephone number is (571)270-1148. The examiner can normally be reached on Monday through Thursday 7:30 am to 5:00 pm EST and every other Friday from 7:30 am to 4 pm EST.

73. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael LaVilla can be reached on (571)272-1539. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

74. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K. B./
Andrew K. Bohaty
Patent Examiner, Art Unit 4132
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